Southwest Indian Ocean Bathymetric Compilation (swIOBC)

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Introduction

As a result of long-term scientific activities in the southwest Indian Ocean, an extensive amount of swath bathymetric data has accumulated in the AWI database. Using these data as a backbone, supplemented by additional bathymetric data sets and predicted bathymetry, we generate a comprehensive regional bathymetric data compilation for the southwest Indian Ocean (swIOBC).

- Digital Bathymetric Model (DBM) with 8" x 8" (250 m x 250 m) resolution
- Covering the area from **4° to 40° S and 20° to 45° E**.
- Corresponding map and source identification grid

This will support geological and climate research, e.g.:
- Identification of current-induced seabed structures
  → modelling oceanic currents
- Analysis of the sediment distribution
  → reconstruct erosional history of Eastern Africa

Workflow

Based on the IBCSO working steps (Arndt et al., 2013). All contributed data sets have been transformed into a generic ASCII XYZ data format, including weighting factors and unique source identification codes as point attributes.

The DBM will be derived using an iterative process of gridding and cleaning the data. Gridding will be performed similar to IBCAO (Jakobsson et al., 2012) and IBCSO (Arndt et al., 2013) using a remove-restore and a gap-fill method.
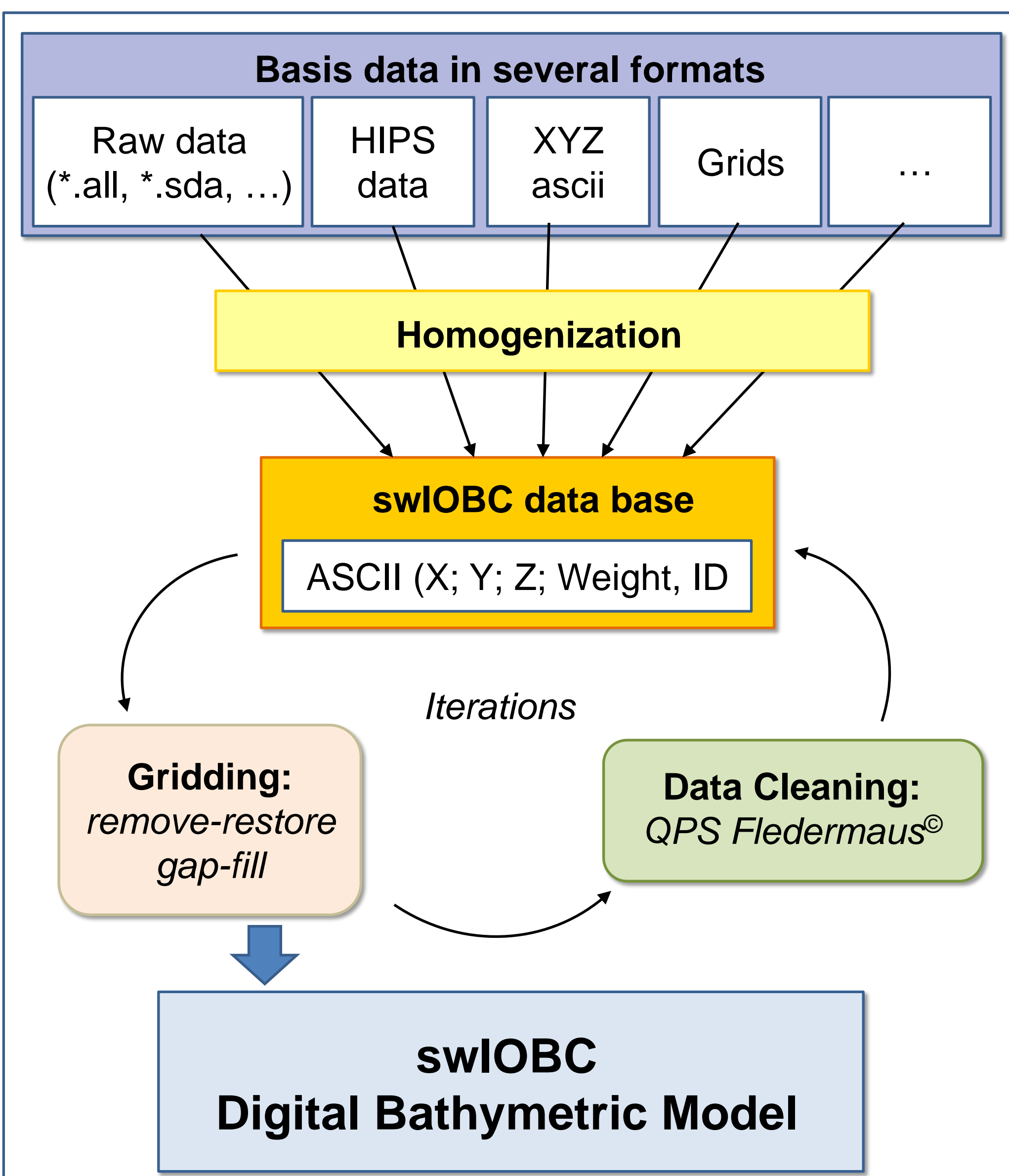

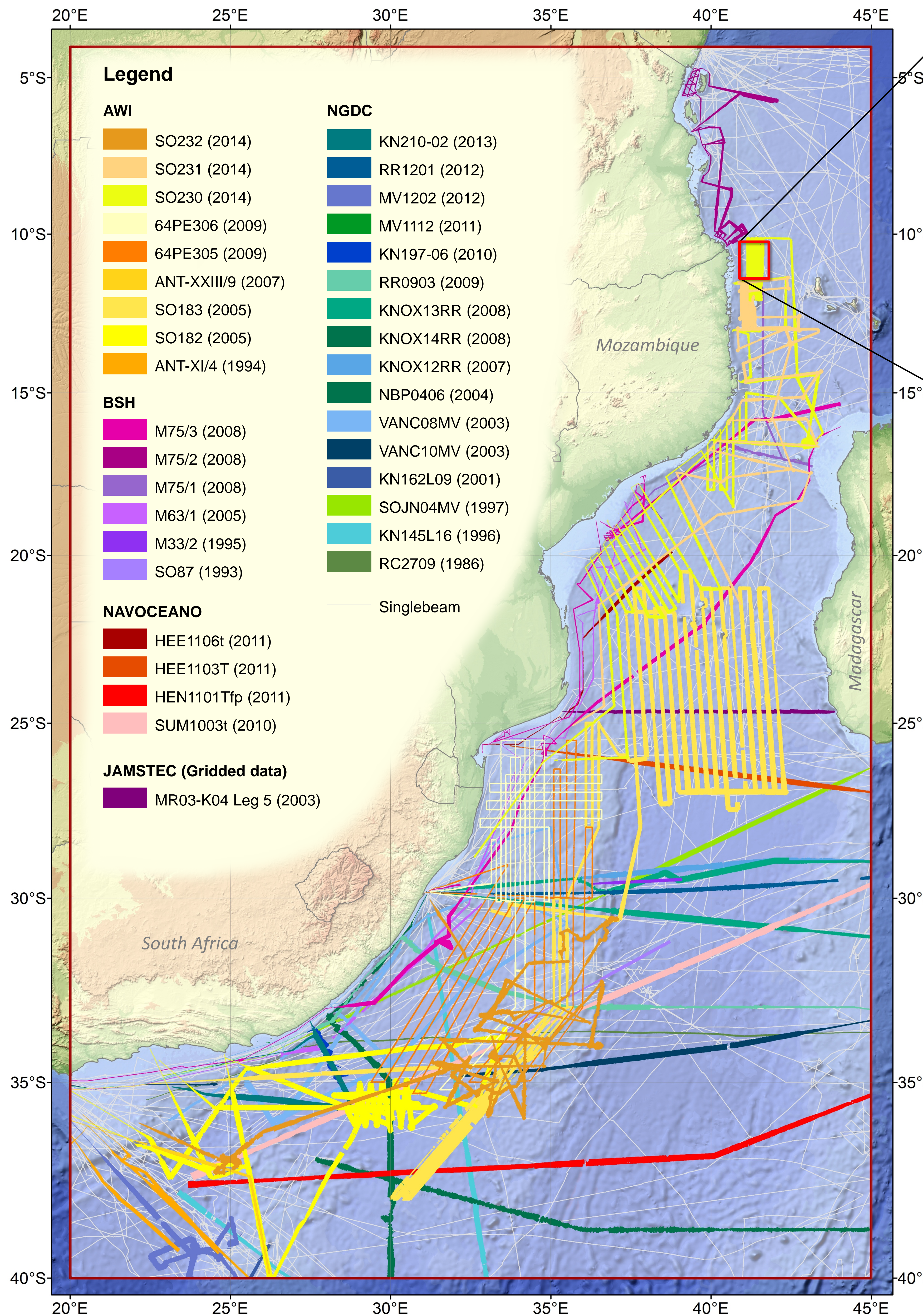*Figure 1:* Scheme of working steps to create the swIOBC

Figure 2: Map of the current database used for the swIOBC, showing the multibeam coverages and the singlebeam track lines. The background data set is the GEBCO_08 DBM.
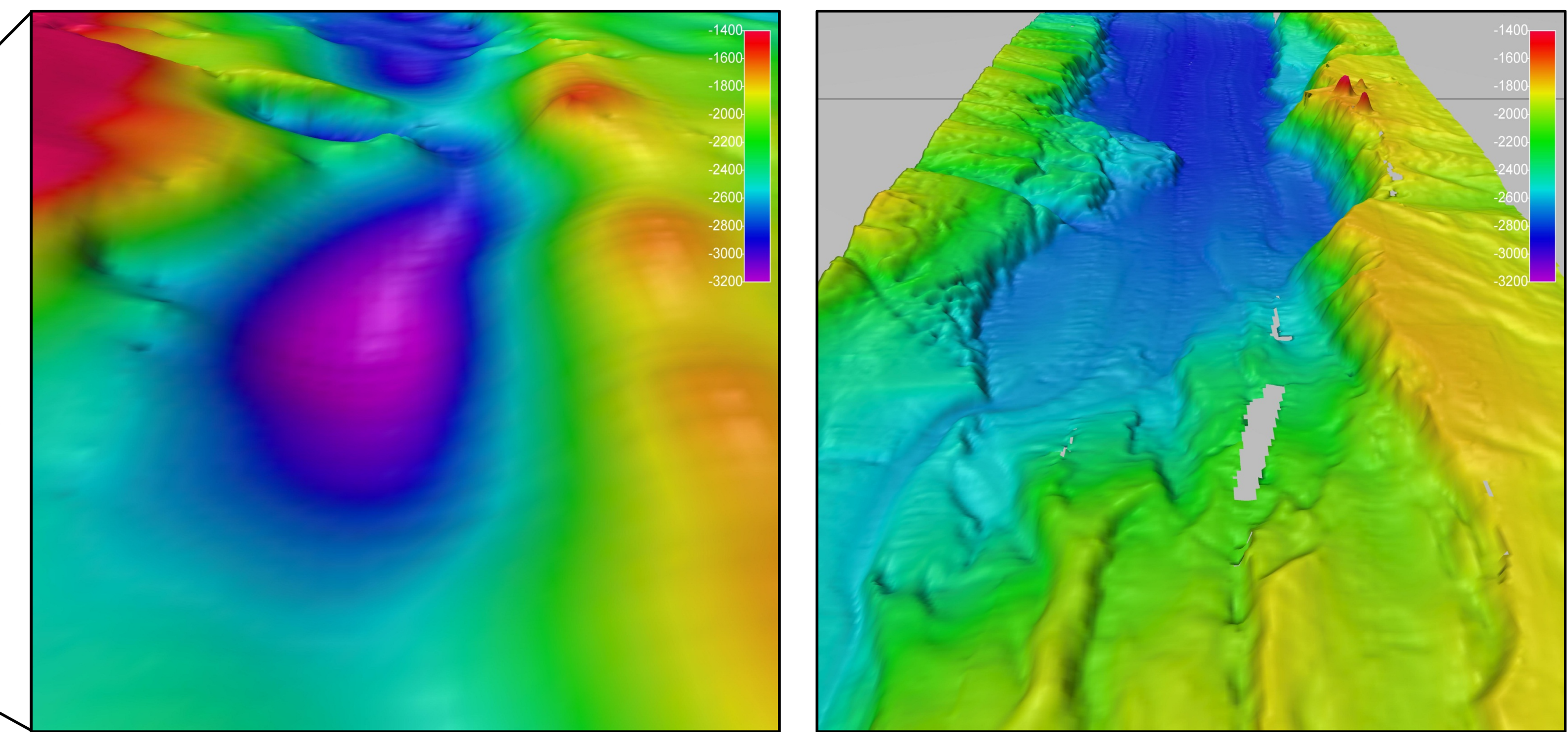
Legend

AWI
- SO232 (2014)
- SO231 (2014)
- SO230 (2014)
- 64PE306 (2009)
- 64PE305 (2009)
- ANT-XXIII/9 (2007)
- SO183 (2005)
- SO182 (2005)
- ANT-XI/4 (1994)

BSH
- M75/3 (2008)
- M75/2 (2008)
- M75/1 (2008)
- M63/1 (2005)
- M33/2 (1995)
- SO87 (1993)

NAVOCEANO
- HEE1106t (2011)
- HEE1103T (2011)
- HEN1101Tfp (2011)
- SUM1003t (2010)

JAMSTEC (Gridded data)
- MR03-K04 Leg 5 (2003)

NGDC
- KN210-02 (2013)
- RR1201 (2012)
- MV1202 (2012)
- MV1112 (2011)
- KN197-06 (2010)
- RR0903 (2009)
- KNOX13RR (2008)
- KNOX14RR (2008)
- KNOX12RR (2007)
- NBP0406 (2004)
- VANC08MV (2003)
- VANC10MV (2003)
- KN162L09 (2001)
- SOJN04MV (1997)
- KN145L16 (1996)
- RC2709 (1986)

Singlebeam

Figure 3: 3D view of the Kerimbas Graben off the northern Mozambique coast. Left: Existing GEBCO_08 grid, 30" resolution. Right: Gridded multibeam data of SO230 (2014), 8" resolution as the swIOBC will provide. Shown dimensions: East/West ~58 km, North/South ~175 km.

Objectives

Combining in-house data with external echosounding data allow for the generation of a regional grid, significantly improving the existing, mostly satellite altimetry derived, bathymetric models. Figure 3 shows an example how high resolution multibeam data can improve the existing grid (GEBCO). Much more details of the seafloor morphology are resolved (e.g. small canyons and hills).

Data basis

Current (multibeam) data providers:
- Alfred Wegener Institute (AWI), Germany
- Bundesamt für Seeschifffahrt und Hydrographie (BSH), Germany
- Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Germany
- GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Germany
- Royal Netherlands Institute for Sea Research (NIOZ), Netherlands
- National Geophysical Data Center (NGDC), USA
- Naval Oceanographic Office (NAVOCEANO), USA
- Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan

The collected data sets are heterogeneous in terms of age, acquisition system, background data, resolution, accuracy, and documentation. Regions not covered with direct depth measurements will be filled with data from the General Bathymetric Chart of the Oceans (GEBCO).

If you know of any other data sets from this area –
PLEASE LET US KNOW!

Table 1: Statistical properties of the swIOBC data basis

	Multibeam	Singlebeam	Gridded data	GEBCO
Track length [km]	155,700 (61% AWI)	248,600	950	--
Data points	~1,430,114,000	~141,000	~260,000	~5,847,000
Coverage [% of area]	21.2	--	0.2	78.5

References:
Arndt, J.E., et al., 2013. The International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0—A new bathymetric compilation covering circum-Antarctic waters. GRL 40, 1-7, doi: 10.1002/grl.50413, 2013.
Jakobsson, M., et al., 2012. The International Bathymetric Chart of the Arctic Ocean (IBCAO) Version 3.0. GRL 39, L12609, doi: 10.1029/2012GL052219.
BODC for GEBCO on behalf of the IHO and the IOC, GEBCO_08, published by British Oceanographic Data Centre, Liverpool.

Basis data in several formats

| Raw data (*.all, *.sda, …) | HIPS data | XYZ ascii | Grids | … |

Homogenization

swIOBC data base
ASCII (X; Y; Z; Weight, ID)

Iterations

Gridding: *remove-restore gap-fill*

Data Cleaning: QPS Fledermaus©

swIOBC Digital Bathymetric Model

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